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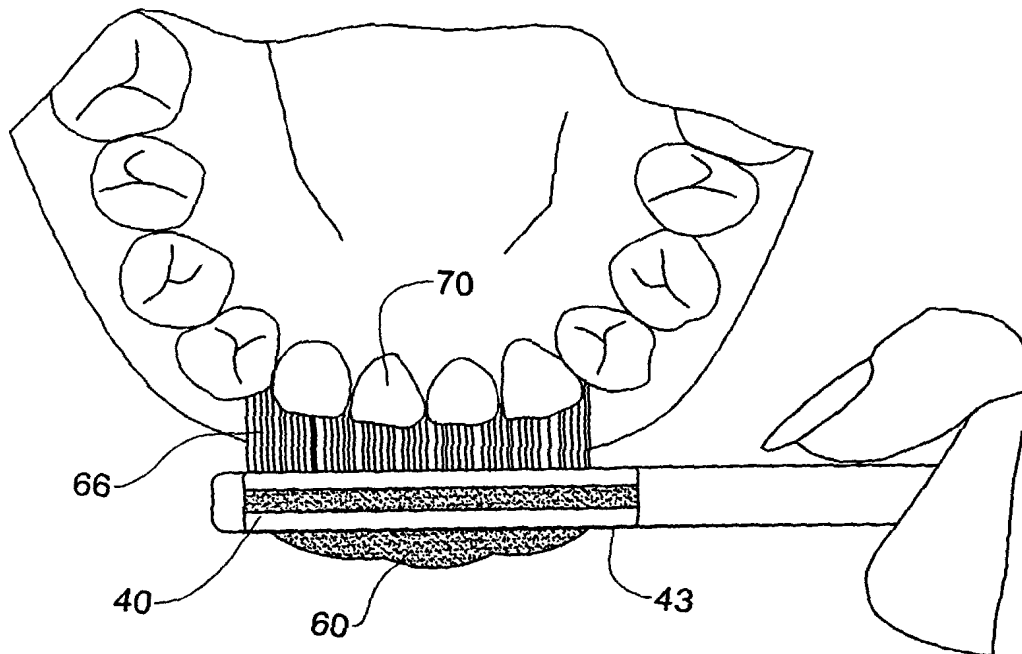
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(54) Title: IMPROVED TOOTHBRUSH



(57) Abstract: A toothbrush comprising an elongate handle fitted at one end thereof with a brush head, comprising a support frame accommodating a resilient bed fitted with a plurality of fixed bristle tufts. The bed is elastically deformable in a direction essentially parallel to an axis of the bristles.



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IMPROVED TOOTHBRUSH

FIELD OF THE INVENTION

The present invention relates to toothbrushes and in particular it is concerned with an improvement related to the toothbrush head.

BACKGROUND OF THE INVENTION AND PRIOR ART

5 Mouth hygiene in general and dental care in particular have become in the recent years a major issue and it has now long been realized that correct teeth brushing plays a great role in ensuring the health of the teeth and gums.

Many recommendations have been issued throughout the years concerning correct strokes during the brushing for ensuring maximal penetration of the bristles
10 between the teeth and accordingly a variety of inventions have been made in this field providing different solutions, e.g. converting linear strokes in one direction into strokes in a perpendicular direction, converting linear strokes into rotary of the bristles etc. Other recommendations are concerned with the firmness of brushing which as it has become apparent plays a great role in mouth hygiene. Various
15 solutions have been provided in this regard as well such as, for example, bristles of varying length distributed along the toothbrush head, bristles of different rigidity, bristle tufts supported by springy members, elastic brush heads, etc.

It is furthermore appreciated that a conventional toothbrush has typically an essentially flat head portion and the bristles are secured thereto by different means,
20 whereby it is assumed that bristles will penetrate between the teeth by the manual manipulation of the toothbrush imparted by the user or by forming the head of the toothbrush with several bristle tuft arrays which are in some way or another movable with respect to one another so as to assume different positions during a tooth brushing performance.

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Many toothbrush heads are arranged such that the bristles are of uniform length which obviates their following the contour of the jaw of a person using it. After a short while, typically several months, the bristles deform, owing to the pressure applied thereto by the user. Other toothbrushes are arranged such that the
5 bristles are of different length and are adapted to improve penetration into the gaps between the teeth. Nevertheless, this arrangement provides a fixed contour of the brush which not only does not fit every individual, it differs at different locations when applied to the teeth.

Amongst a large variety of patents concerned with toothbrushes, US Patent
10 No. 5,269,038 discloses a toothbrush which automatically provides an up/down stroking action in concert with a side-to-side stroke action as the toothbrush is manipulated in a brushing process. The brush comprises two pairs of elongated bristle-carrying pads with the pads of each pair positioned side-by-side and the pairs of end-to-end. Each pad is hinged to the pad-holding end of the brush with the
15 hinge axis being angularly related to an elongate axis of the pad. Owing to the structure of this toothbrush, in use, the bristles are allowed to follow the contour of a tooth and to penetrate into the space between the tooth and the gums. However, this toothbrush does not provide an arrangement for following the contour of the teeth in an arced shape.

20 US Patent No. 5,991,959 discloses a toothbrush in which the head has a skeleton, a resilient member mounted on at least one type of the skeleton, tuft mounts in the skeleton and/or resilient member for receiving bristles, the resilient member bristle tuft being capable of toggling movement, the resilient member tuft mounts having an array of rigid receptacles or wells attached to the skeleton by a
25 bridge hinge, characterized in that the bridge hinges are broken. A toothbrush in accordance with this patent has the advantage of the head being repeatedly and resiliently movable in a multidirectional manner to provide more effective cleaning. However, this patent does not suggest an arrangement where the toothbrush head dynamically assumes the contour of the teeth.

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A different arrangement is disclosed in US Patent No. 5,881,426 wherein a brush is fitted with flexible bristles in which each bristle includes a flexion integral with the bristle to provide resilience to the bristle for flexing it along its longitudinal axis. The brush includes a perforated brush head for passing the
5 bristles so as to maintain the bristles on their axis. This arrangement has a significant drawback in that it is quite likely that after a short while toothbrush and other dirt accumulates under the brush head and prevents the normal functioning of the brush. Furthermore, the axial extent of displacement is significantly restricted.

US Patent No. 5,839,149 discloses a toothbrush wherein the brush head
10 comprises a flexible member formed with a bristle support portion and adapted for resilient flexure and is caused to change its shape between a flat position and a deformed position in which side arrays of bristles tufts incline towards a central array of bristle tufts. The flexible member is deformable along an axis which is coaxial with elongate axis of the toothbrush handle and thus does not provide for
15 the bristle tufts to follow the arc shape of the teeth of a user during a brushing process.

US Patent No. 5,774,923 discloses still another toothbrush fitted with a flexibly linked zone at its head whereby a longitudinal axis of a head portion may intersect with a longitudinal axis of the handle of the toothbrush, though remaining
20 in the same plane.

US Patent No. 2,819,482 discloses a toothbrush wherein the head portion is formed with a resilient body mounted on a handle of the toothbrush and wherein a plurality of tuft arrays extend from the handle portion, through the resilient member and project out from the resilient member. This arrangement is useful in particular
25 for massaging the mouth whilst on the other hand it constrains the bristle tufts and prevents them from deforming in any direction.

It is an object of the present invention to provide an improved and novel toothbrush for in the bristles mounted on the head portion assume the shape of the teeth and wherein the bristles penetrate into inter-teeth space, thereby ensuring
30 improved contact of the bristles with the teeth and gum contour.

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SUMMARY OF THE INVENTION

The object of the present invention is to provide a toothbrush wherein the tuft arrays are mounted on a flexible bed having increased resiliency whereby it may be significantly elongated. The toothbrush head is devoid of any moving parts
5 and, by one particular embodiment, the resilient member is molded to a support frame of the brush head without any additional components.

This arrangement renders the brush head a trampoline-like behavior whereby the bristles continuously displace along their longitudinal axis such that an optimal tooth brushing process takes place with essentially continuous contact with
10 the surface of the teeth during a brushing process, ensuring improved penetration into the inter-teeth gaps.

In accordance with the present invention there is provided a toothbrush comprising an elongate handle fitted at one end thereof with a brush head, said brush head comprising a support frame accommodating a resilient bed fitted with a
15 plurality of fixed bristle tufts; said bed being elastically deformable in a direction essentially parallel to an axis of the bristles.

By one particular embodiment the bristle tufts are molded into the bed and wherein the resilient bed is molded into the support frame.

The arrangement in accordance with the present invention is such that when
20 a body applies axial force on the bristles, the support bed deforms so as to allow the bristles to assume a contour of said body. However, the support bed spontaneously returns to its initial shape upon cease of the axial force on the bristles.

By one particular design, the resilient bed is embedded within the support frame whereby periphery edges thereof are fixed to the support frame.

25 According to another aspect of the present invention there is provided a toothbrush for mounting on a toothbrush handle, said head comprising a fitting for articulating it to the handle, and having opposed top and bottom surfaces, which bristles projecting from said top surface, and a bristle bed made of an essentially resilient material and fixedly holding a plurality of bristle tufts, said support bed
30 being deformable in a direction perpendicular to a longitudinal axis of the bristles.

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BRIEF DESCRIPTION OF THE DRAWINGS

In order to understand the invention and to see how it may be carried out in practice, an embodiment of the invention will now be described, by way of a non-limiting example only, with reference to the accompanying drawings, in which:

5 **Fig. 1** is an overall isometric view of a toothbrush in accordance with the present invention;

Fig. 2 is a portion of the toothbrush head illustrating a support frame, the bristle carrying member and the bristles being removed;

Fig. 3 is an isometric, sectional view taken along line III-III in Fig. 1;

10 **Fig. 4** illustrates the toothbrush of the present invention at a side elevation, during a toothbrush process, applied to the teeth of an individual;

Fig. 5A is an isometric view of a support frame in accordance with an embodiment of the invention;

Fig. 5B is a section taken along line V-V in Fig. 5A; and

15 **Fig. 5C** is a section taken along line V-V in Fig. 5A showing also a bristle support bed fitted with bristle tufts.

DETAILED DESCRIPTION OF THE INVENTION

Fig. 1 illustrates a toothbrush in accordance with the present invention
20 generally designated **20** comprising an elongate handle designated **22** and extending between a proximal end **24** and a distal end **26**, and a brush head designated **30** integrally extending from said handle. Brush head **30** comprises a support frame **36** made of a rigid material and in the present example constitutes an integral extension of the handle **22**. However, in accordance with an embodiment
25 of the invention (not shown) head **30** may be removably connected to a handle of a toothbrush, e.g. an electric toothbrush in which case the frame **36** comprises suitable engagement means for coupling with a corresponding engagement arrangement of the handle.

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As can best be seen in Fig. 2, support frame 36 is a two-layer hollow structure comprising a top member 38 and a bottom member 40, said top member having an upper surface 42. The top member 38 and the bottom member 40 are reinforced by integral supports 44 and 46 with a gap 48 extending between the two members and a central cavity 50 defined within said support frame 36.

As seen in Figs. 1 and 2, received within cavity 50 there is a bristle support bed 60 made of an elastically deformable material such as, for example, silicon rubber or other synthetic rubber having a significant elongation coefficient, e.g. of about 600% or so. In the present embodiment the bristle support bed 60 is molded within the cavity 50 and projects into the gaps 48 between the top member 38 and the bottom member 40 whereby it becomes secured at its perimeter to the support frame 36. Suitable gripping members 64 (Fig. 2) may be provided for increasing the support of the perimeter of the bristle support bed 60 within the frame 36.

As seen in Figs. 1 and 3, the bristle support bed 60 is essentially flush with the upper surface 42 of the top member 38 with a plurality of bristle tufts 66 upwardly projecting therefrom. In the present example, the bristle support bed is flush also at its bottom surface 65 with the lower surface 43 of the bottom member 40 (Fig. 3).

A person versed in the art will appreciate that the bristle tufts may be arranged at a variety of arrays, as known *per se*, and may also have different rigidity, different lengths, etc.

The arrangement of the toothbrush in accordance with the present invention is such that the bristle support bed 60 is significantly deformable in a direction essentially parallel to the longitudinal axis of bristle tufts 66 whereby depressing the bristles against the teeth 70 of an individual entails significant deformation of the bristle support bed 60 in a direction essentially parallel to a longitudinal axis of the bristles 66, whereby the free ends of the bristles assume the contour of the teeth 70 or of the gums, respectively, and whereby the bristles penetrate into the inter-teeth interstices for improved performances. As the brush displaces along the

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jaw, the bristles continuously assume the respective shape, owing to high elasticity of the bristle support bed.

In the embodiment of Fig. 4 the bristle support bed **60** is illustrated in its deformed state where it extends beyond the lower surface **43** of the bottom member **40**. It seen, the bottom surface of the support bed **60** assumes an undulating shape conforming essentially with the shape of the theath/gums.

Turning now to Figs. 5A to 5C, there is illustrated another embodiment of the invention wherein the support frame designated **76** comprises a top member **78** having an upper surface **80** and a bottom member **82** having a lower surface **84**. The main differences as compared with the previous embodiment is that the top member **78** is narrower and on that account the bottom member **82** is wider and furthermore, the bottom member **82** is formed with a bottom cover plate **86**, which may be integrally formed therewith or attached thereto, e.g. by adhering or welding, etc.

As can be seen in Fig. 5C, the bristle support bed **90** is essentially flush with the upper surface **80** of the top member **78** and is supported at its perimeter as explained in connection with the previous embodiment, to the frame **76**, leaving a deformation space **94** whereby, when the bristle support member **90** deforms it does not project beyond the lower surface **84** of the bottom member **82**.

It is to be appreciated that the bristle support bed may be molded within the support frame or otherwise adhered thereto in a manner which provides peripheral support to the bristle support member whereby it will not disengage from the support frame as it deforms. Furthermore, it is advantageous that the bristle support bed is hermetically supported by the support frame whereby no liquids and dirt can enter and accumulate in the toothbrush head.

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CLAIMS:

1. A toothbrush comprising an elongate handle fitted at one end thereof with a brush head, said brush head comprising a support frame accommodating a resilient bed fitted with a plurality of fixed bristle tufts; said bed being elastically
5 deformable in a direction essentially parallel to an axis of the bristles.
2. A toothbrush according to Claim 1, wherein the bristle tufts are molded into said bed.
3. A toothbrush according to Claim 1, wherein the brush head is a two
component molding comprising the resilient bed and an essentially rigid support
10 frame accommodating the bed.
4. A toothbrush according to Claim 1, wherein the bed is embedded within the support frame, whereby periphery edges thereof are fixed to the support frame.
5. A toothbrush according to Claim 1, wherein when a body applies axial force on the bristles, the support bed deforms so as to allow the bristles to assume a
15 contour of said body.
6. A toothbrush according to Claim 1, wherein depressing the bristles against teeth entails deformation of the support bed whereby the bristles to assume the contour of the teeth.
7. A toothbrush according to Claim 5, wherein the support bed spontaneously
20 returns to its initial shape upon cease of the axial force on the bristles.
8. A toothbrush according to Claim 1, wherein the brush head has a top and a bottom face, said bristles projecting from the top face, and whereupon deformation of the support bed it does not exceed the bottom face of the brush head.
9. A toothbrush according to Claim 1, wherein the support bed is defines a
25 confined space, where said support bed is further deformable into said space.
10. A toothbrush according to Claim 1 wherein the support bed is deformable to an extent which does not exceed a bottom surface of the brush head.
11. A toothbrush according to Claim 1, wherein the bed is made of a silicone rubber.

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12. A toothbrush according to Claim 1, wherein the bed is elastically deformable in a direction essentially normal to a longitudinal axis of the handle.
13. A toothbrush according to Claim 1, wherein the support bed is divided into elasticity zones, each having a different elasticity module.
- 5 14. A toothbrush according to Claim 1, wherein the support frame has opposed top and bottom surfaces, and where a top surface of the support bed is essentially flush with the top surface of the support frame with side edges of the support frame embracing the support bed.
15. A toothbrush according to Claim 1, wherein the support frame comprises
10 side walls formed with lateral indentations and where the support bed has corresponding lateral projections clamped within said indentations.
16. A toothbrush comprising an elongate handle having a proximal end and a distal end, defining therebetween a longitudinal axis of the handle; a bristle support frame at one end of the handle, having opposed top and bottom surfaces, with
15 bristles projecting from said top surface; and a bristle bed made of an essentially resilient material fixedly attached to said support frame and fixedly holding a plurality of bristle tufts, said support bed being deformable in a direction parallel to a longitudinal axis of the bristles.
17. A toothbrush according to Claim 16, wherein the bristle bed is deformable
20 in a direction essentially normal to the longitudinal axis of the handle.
18. A toothbrush according to Claim 16, wherein the bristle bed is embedded within the support frame.
19. A toothbrush according to Claim 16, wherein depressing the bristles against teeth entails deformation of the support bed whereby the bristles to assume the
25 contour of the teeth.
20. A toothbrush head for mounting on a toothbrush handle, said head comprising a fitting for articulating it to the handle, and having opposed top and bottom surfaces, with bristles projecting from said top surface, and a bristle bed made of an essentially resilient material and fixedly holding a plurality of bristle

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tufts, said support bed being deformable in a direction perpendicular to a longitudinal axis of the bristles.

21. A toothbrush head according to Claim 20, wherein the bristle bed is flush with the top surface of the head.

5 **22.** A toothbrush head according to Claim 20, wherein the bristle bed is deformable in a direction essentially normal to the longitudinal axis of the handle.

23. A toothbrush head according to Claim 20, wherein depressing the bristles against teeth entails deformation of the support bed whereby the bristles to assume the contour of the teeth.

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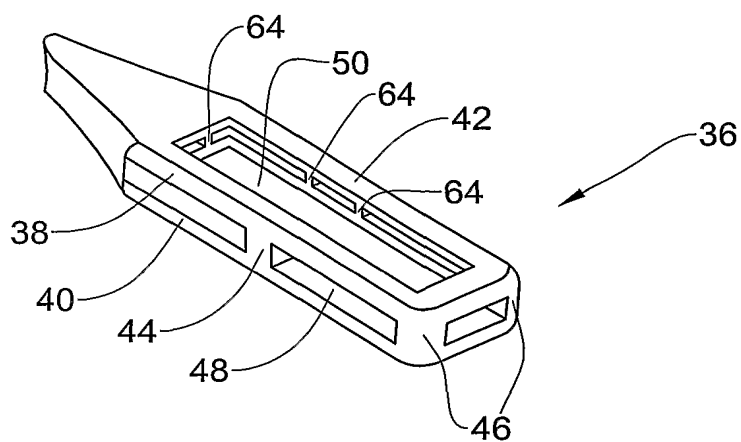
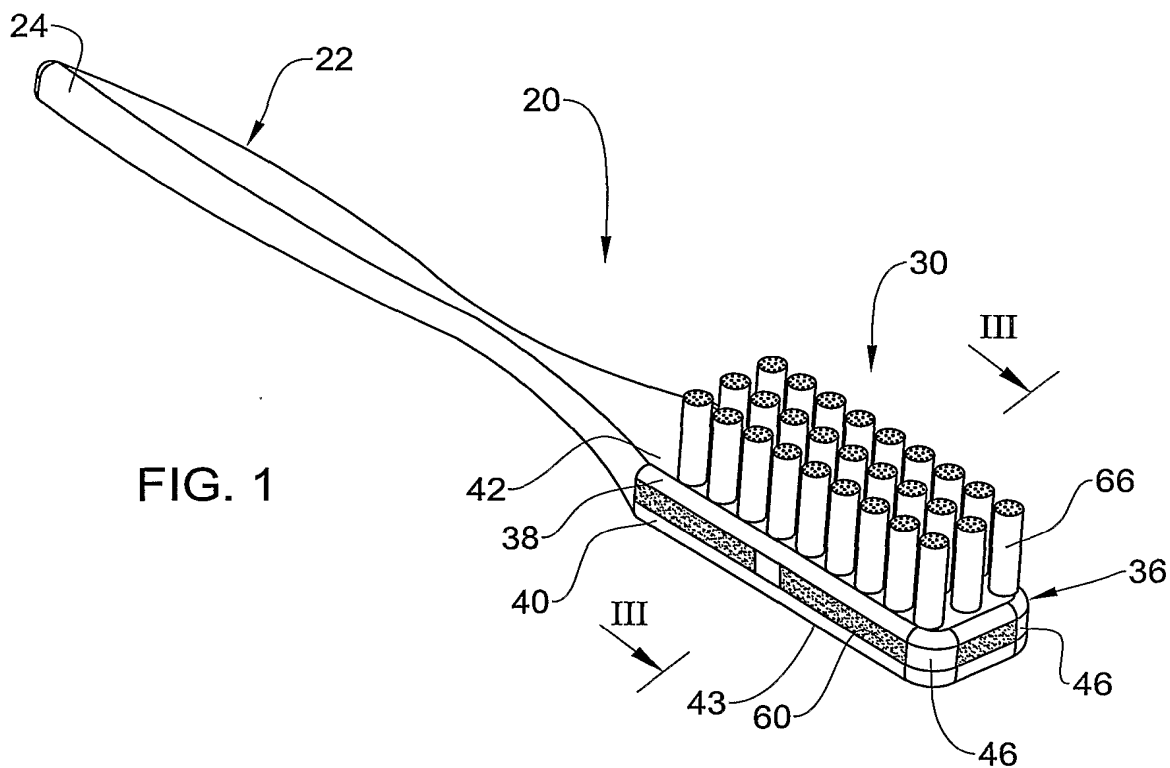
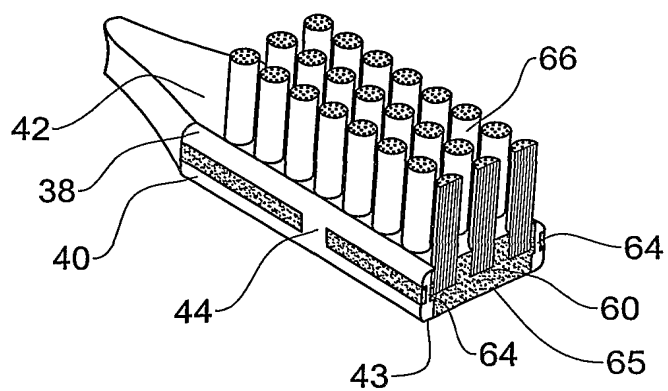


FIG. 3



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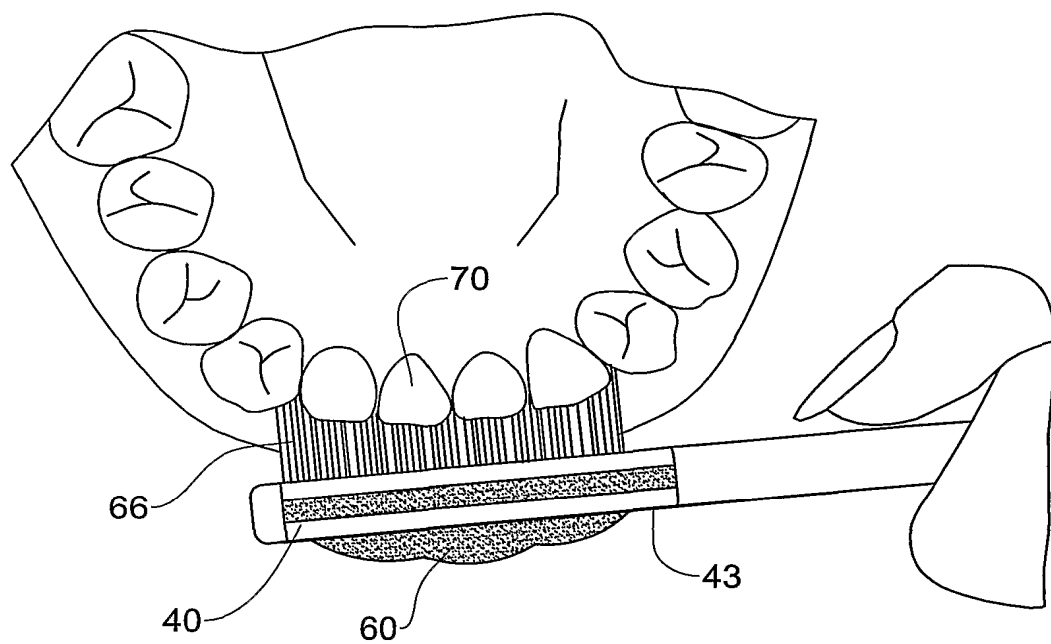


FIG. 4

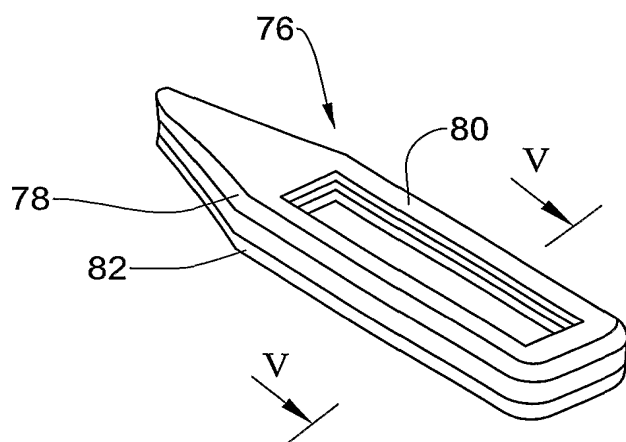


FIG. 5A

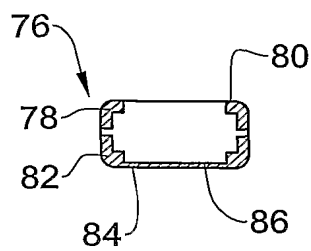


FIG. 5B

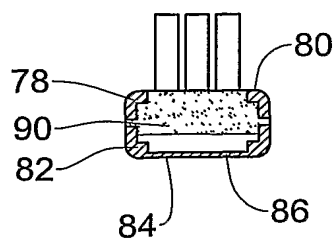


FIG. 5C

INTERNATIONAL SEARCH REPORT

International Application No

PCT/IL 02/00522

A. CLASSIFICATION OF SUBJECT MATTER
 IPC 7 A46B3/20 A46B5/00 A46B9/04

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 A46B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, WPI Data, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 4 633 542 A (TARAVEL BERNARD) 6 January 1987 (1987-01-06) the whole document	1-12, 14, 16-19
Y	-----	20-23
Y	WO 98 37788 A (SMITHKLINE BEECHAM CONSUMER ;KRAMER HANS (DE)) 3 September 1998 (1998-09-03) the whole document	20-23
X	US 4 240 452 A (JEAN SAN-BAU) 23 December 1980 (1980-12-23) the whole document	1, 5-12, 14, 16, 17, 19
A	US 4 694 844 A (BERL MARTA N ET AL) 22 September 1987 (1987-09-22) the whole document	1-23

☐

Further documents are listed in the continuation of box C.

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Patent family members are listed in annex.

* Special categories of cited documents :

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INTERNATIONAL SEARCH REPORT

Information on patent family members

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